

Assessing Refractive Status

INTRODUCTION

The eye (Fig. 6.1) plays an important role as an organ for vision in life. It helps in interpreting the shape, colour, and dimensions of the objects around us. The human eye can see in bright or dim light, but it cannot see objects when there is no light.

Due to excessive stress factors, such as reading, watching television from a close range, working on computers all day, etc., the vision may be affected. An individual can have myopia, hyperopia, astigmatism, or presbyopia. These eye diseases can be corrected by the use of contact lenses, spectacles, or clinical surgery. Here, we will discuss about refractive error and its types, and how to identify refractive error. Also, various methods of correcting or curing the eyesight will be discussed in this unit. Important terms and methods, such as laser surgery, keratometry, retinoscopy, ophthalmoscopy, auto refraction, photo-refraction, etc., will be discussed in detail. Techniques and procedures of retinoscopy, and auto-refractor and neutralisation will be described briefly.



Fig. 6.1: Human Eye

SESSION 1: MEANING OF REFRACTIVE STATUS AND REFRACTION

In this session, you will learn about the symptoms, common refractive errors, ophthalmoscopy and the steps followed in neutralisation and its treatment.

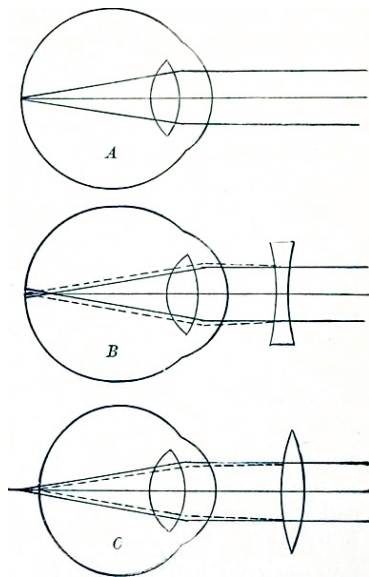


Fig. 6.2: The most common refractive errors

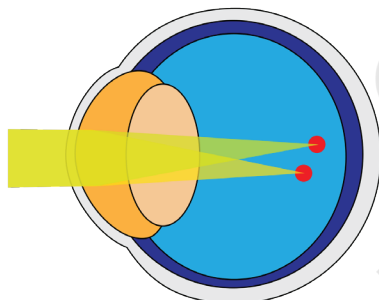


Fig. 6.3: Multiple focus points in astigmatism

Refractive error

In simple words, refractive error is a condition when light rays do not fall on the retina in the eye (Fig. 6.2). It is an eye disorder and is found in 70% of the total population. The refractive errors cause a blurred vision; as a result, it may cause visual impairment.

Symptoms

- Blurred vision
- Difficulty in reading or seeing at a close distance
- Crossing of the eyes in children, i.e., squint

Types of refractive errors

Myopia (near-sightedness)

Myopia, commonly known as near-sightedness or short-sightedness, is a condition in which there is difficulty in seeing distant objects clearly.

Hyperopia (far-sightedness)

Hyperopia, commonly known as far-sightedness or long-sightedness, is a condition in which there is difficulty in seeing close objects clearly.

Astigmatism

Astigmatism refers to distorted vision, as the image is formed on multiple points of the retina (Fig. 6.3).

Presbyopia

In this condition, a person has difficulty in reading or seeing at an arm's length. It is an ageing process of the eye.

Diagnosis of different types of refractive errors

Refractive errors may rise from many different causes. Diagnosis of refractive errors is normally confirmed

by recording VA by an eye care specialist, and by retinoscopy. An automated refractor is an instrument used in place of retinoscopy to estimate a person's refractive error.

Presbyopia

An eye doctor will ask the patient to read the near vision chart and will give suitable corrections. The patient can also consult with the doctor for presbyopia surgery as an alternate method of treatment.

Astigmatism

The patient has a blurred vision when he/she reads the Snellen chart for distant vision. Keratometry may be used to measure the curvature of the cornea's front surface confirmed by corneal topography.

Treatment

The management of refractive errors depends upon the type of error of refraction. The refractive error may be corrected by using glasses, contact lenses and refractive surgery.

Optical image of retinoscopy

Ophthalmoscopy

Also known as funduscopy, it is a test to see the inside of the eye to examine the cavity (fundus) of the eye, vitreous and other structures (Fig. 6.4). It is a routine test while the examination of the eye is done. The goal is to get the best view of the cavity of eye.



Fig. 6.4: An ophthalmologist performing retinoscopy

Direct examination

The patient is made to sit on a chair. The lights in the room are to be turned off or dimmed. The ophthalmologist sits across the patient and uses an ophthalmoscope to examine the patient's eye. An ophthalmoscope is used for the examination. It has a light and several small lenses for the ophthalmologist

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to look through. The ophthalmologist may ask the patient to look in certain directions as he or she looks at the back of the eyes.

Indirect examination

It helps to see the structures at the back of the eye, in detail. The patient has to lie down or sit in a reclined position. The ophthalmologist will have a bright light positioned around his or her forehead that will be thrown in the patient's eye. A lens is to be held in front of the eye, the doctor will hold the patient's eye open to look into it. The patient is asked to look in certain directions. Pressure may be applied on the patient's eye with a small, blunt, probe. This may be uncomfortable but is not painful.

Auto-refractor

An auto-refractor or automated refractor is a computer-controlled machine used to measure the refractive error.

Neutralisation

The power of an unknown lens can be determined by neutralising it with another lens of known power.

Practical Exercises

1. Visit an eye care unit or clinic and observe the methods of recording visual acuity, refractive error and the procedure of correction.
2. A patient visualises a clear view of the objects that are near to him and visits the clinic. How would you conclude what type of refractive error the patient is suffering from?
3. An old lady is unable to visualise anything clearly. If the doctor asks you to find out what type of refractive error the lady is suffering from and suggest a way of curing the condition, what would you suggest?
4. A patient seems to be suffering from myopia and you were to test her eyes. What is the method of confirmation that you will use to know that the person is suffering from myopia?
5. Visit an eye care unit or clinic to observe operation of an ophthalmoscope and auto-refractometer.



CHECK YOUR PROGRESS

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A. Fill in the blanks

1. _____ is used to measure the curvature of the steepest and flattest meridians in the cornea's front surface.
2. _____ is a computer-controlled machine used during an eye examination to provide a rough measurement of a person's _____.

B. Write a short notes on the following.

1. Ophthalmoscopy
2. Auto-refractor
3. Keratometry

C. Short answer questions (30-40 words)

1. What is refractive error? State some of its symptoms.
2. Classify the types of refractive errors.
3. What are the primary treatments for a myopic patient?
4. State briefly about the diagnosis of presbyopia?
5. Define neutralisation. State the steps of performing it (Use a separate sheet if needed).

D. State whether the following are True or False

1. Eyeglasses, contact lenses, and refractive surgery are the secondary options to treat the visual symptoms of those with myopia.
2. An automated refractor is an instrument that is sometimes used in place of retinoscopy to objectively estimate a person's refractive error.
3. Blurred vision is one of the symptoms of refractive errors.

SESSION 2: PROCESS OF RETINOSCOPY

In this session, you will learn about the process of retinoscopy and its optical principle.

Retinoscopy

It is the technique to obtain an objective measurement of the refractive error of the patient's eyes. The examiner

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uses a retinoscope to pass light into the patient's eyes and the reflection of the patient's retina is observed by the eye-specialist. The light reflex is neutralised by lenses and the prescription of the lenses is given to prepare spectacles.

Retinoscope

The retinoscope is a small handheld instrument that is self-luminous and is used to measure the refractive condition of the eyes for the correction of refractory error.

Types of retinoscopy

Static retinoscopy

It is a type of retinoscopy that is used to determine the refractive error of patients.

Dynamic retinoscopy

In this, the patient is made to focus on a nearby object rather than distant objects. The term dynamic means the accommodation of the patients is active. The results of the static and dynamic retinoscopy are the same.

Book retinoscopy

This type of retinoscopy is specially done or performed for children, with the help of a picture book. The retinoscopy is performed while the child focusses on the pictures of the book and tries to identify them.

Practical Exercise

1. Visit an eye care unit or clinic to observe the procedure of retinoscopy.
2. A young boy visits the clinic, and you were to perform the retinoscopy of the patient. How are you going to perform the retinoscopy of the patient's eye?
3. An old lady comes to the clinic, and you were to check the retinoscopy reflex of the patient with the help of retinoscope. Explain the process.



CHECK YOUR PROGRESS

A. Fill in the blanks

1. _____ retinoscopy is used to determine the refractive error of patient.
2. The _____ is specially done or performed for children, with the help of a picture book.
3. The _____ is a small handheld instrument that is self-luminous and is used in a standard clinical procedure for measuring the refractive condition of the eye.

B. Multiple choice questions

1. Which of these is a type of retinoscopy specially done or performed on children?
 - a) Static Retinoscopy
 - b) MEM Retinoscopy
 - c) Dynamic Retinoscopy
 - d) Book Retinoscopy

SESSION 3: OPERATION OF AUTO-REFRACTOMETER

In this session, you will learn about auto-refraction, types of auto-refraction, techniques and methods of auto-refraction.

Auto-refractometer

An auto-refractometer also called an automated refractor, is a device used for eye examination to determine visual accuracy. The auto-refractometer has been in use since the 1970s. It quickly became a popular diagnostic device because of its ease of use. Refractive errors are diagnosed with this device and can help the doctor to determine whether a person needs spectacles or contact lenses (Fig. 6.5).



Fig. 6.5: Auto refractor equipment

Cycloplegic refraction

This is a procedure used to determine a patient's refractive error by temporarily paralysing the ciliary

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muscles. Eye drops are used to temporarily paralyse or relax the ciliary body of the eyes. Cycloplegic refraction is sometimes used when testing the vision of young children. A cycloplegic refraction is also performed as part of vision correction by laser or LASIK technique to determine the absolute refractive error before proceeding with laser eye surgery.

Techniques and methods of auto-refraction

The procedure of auto-refraction includes the following steps:

- Cycloplegic drops with one drop of proparacaine, 4% and 1% cyclogyl once or twice in 40 minutes is put in eyes.
- A manual cycloplegic retinoscopy is performed with the help of a trial frame.
- The difference in diopters, between the auto-refraction and manual retinoscopy is calculated.

Reasons for auto-refractor testing

Auto-refractor is used by eye care professionals help determine whether a patient needs spectacles or contact lenses. Modern auto-refractor is extremely accurate and easy to use. They save time during eye examination. The cycloplegic drops are not needed to perform refraction.

Practical Exercise

Visit an eye care unit or clinic to observe the method of refraction by an auto-refractor.

CHECK YOUR PROGRESS

A. Fill in the blanks

1. An auto-refractor is also called an _____.
2. _____ drops with one drop of _____ (4%) and 1% cyclogyl, once or twice in 40 minutes is put in the eyes.



B. Write short notes on the following.

1. Techniques and methods of auto-refraction
2. Reasons for auto-refractor testing
3. Types of auto-refraction

C. Short answer questions (30-40 words)

1. What is retinoscopy based auto-refractor?
2. How is an auto-refractor test performed?

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